Summary of the Invention:

It is therefore an object of the present invention to provide a barrier rib material for a plasma display panel which is low in dielectric constant and which is capable of forming a barrier rib having sufficient strength for practical application.

After intensive investigations, the present inventors have found that the objects can be achieved by the use of specific proportions of an alumina powder and two or more silica powders as a filler powder. The present invention has been accomplished based on these findings.

Specifically, the present invention provides, in one aspect, a barrier rib material for a plasma display panel which includes a glass powder and a filler powder.

In the barrier rib material, the filler powder includes from 10% to 90% by mass of a silica powder, from 10% to 90% by mass of an alumina powder, and from 0% to 40% by mass of a titanium oxide powder.

The silica powder includes from 25% to 75% by mass of an α-quartz powder and/or a cristobalite powder, and from 25% to 75% by mass of a quartz glass powder.

The barrier rib material for a plasma display panel of the present invention has a low dielectric constant and can form a barrier rib having sufficient strength for practical application. Additionally, the barrier rib material can have a thermal expansion coefficient similar to that of a glass substrate. The barrier rib material is therefore suitable and useful as a barrier rib material for a plasma display panel.

Brief Description of the Drawings:

A sole figure is a sectional view of a structure of a related plasma display panel.

Description of Preferred Embodiments:

The barrier rib material for a plasma display panel of the present invention (hereinafter briefly referred to as "barrier rib material") uses, as a silica powder, α-quartz ($140 \times 10^{-7}/°C$) and/or cristobalite ($500 \times 10^{-7}/°C$), each having a high thermal expansion coefficient, and a quartz glass ($5 \times 10^{-7}/°C$) having a low thermal expansion coefficient. The entire barrier rib material can have a thermal expansion coefficient of from $60 \times 10^{-7}/°C$ to $85 \times 10^{-7}/°C$.

In addition, each of the α-quartz, cristobalite and quartz glass has a low dielectric constant, thus reducing the dielectric constant of the entire barrier rib material. The barrier rib material also comprises a predetermined amount of an alumina powder as a filler in addition to the silica powder, and thus the resulting barrier ribs can have sufficient strength for practical application.

The present invention specifies the above composition of the filler powder in the barrier rib material of the present invention for the following reasons.

The silica powder serves to reduce the dielectric constant of the barrier rib. If the content of the silica powder in the filler powder is less than 10% by mass, the barrier rib has an increased dielectric constant, and if it exceeds 90% by mass, the barrier rib has decreased strength and cannot maintain its configuration sufficiently. The filler powder preferably comprises from 30% to 70% by mass of the silica powder.

The silica powder includes high-expansion α-quartz and/or cristobalite powder and a low-expansion quartz glass powder. Both the α-quartz powder and cristobalite powder can be used in combination or alone. In the latter case, the α-quartz powder is preferably used due to its availability.

The silica powder comprises from 25% to 75% by mass of the α-quartz powder and/or cristobalite powder and from 25% to 75% by mass of the quartz glass powder. If the total content of the α-quartz powder and cristobalite

powder in the silica powder is less than 25% by mass, the barrier rib material has a decreased thermal expansion coefficient.

In contrast, if it exceeds 75% by mass, the barrier rib material has an excessively increased thermal expansion coefficient. The silica powder preferably comprises from 30% to 70% by mass of the α-quartz powder and/or cristobalite powder and from 30% to 70% by mass of the quartz glass powder.

Specifically, the silica powder desirably includes from 25% to 75% by mass of the α-quartz powder, from 0% to 50% by mass of the cristobalite powder and from 25% to 75% by mass of the quartz glass powder.

More preferably, the silica powder comprises from 30% to 70% by mass of the α-quartz powder, from 0% to 40% by mass of the cristobalite powder and from 30% to 70% by mass of the quartz glass powder.

The alumina powder serves to improve the strength of the barrier rib. If the content of the alumina powder in the filler powder is less than 10% by mass, the barrier rib has insufficient strength and cannot maintain its configuration.

In contrast, if it exceeds 90% by mass, the barrier rib cannot have a sufficiently reduced dielectric constant. The filler powder preferably comprises from 30% to 70% by mass of the alumina powder.

Titanium oxide powder serves to increase the reflectance of the barrier ribs and thereby improves the luminance of the plasma display panel. If the content of the titanium oxide powder in the filler powder exceeds 40% by mass, the barrier rib has an increased dielectric constant. The filler powder preferably comprises from 0% to 35% by mass of the titanium oxide powder.

Regarding particle size distribution, the filler powder should preferably have a 50%-point cumulative particle size distribution (D50) of from 0.3 to 6 μm and a maximum particle diameter (Dmax) of from 5 to 20 μm.